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May 6, 2011

Delta Stewardship Council
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Sacramento, CA 95814

Sent via e-mail: deltaplancomment@deltacouncil.ca.gov

Subject: Sacramento Regional County Sanitation Comments Regarding Third Staff Draft Delta Plan Dated April 22, 2011

Dear Chairman Isenberg and Council Members:

Sacramento Regional County Sanitation District (SRCSD) is providing the following comments and suggested language changes for the Third Staff Draft Delta Plan (Third Draft) released on April 22, 2011. SRCSD appreciates the Delta Stewardship Council's (Council) recognition that the Delta Plan will be an evolving plan over time, informed by science, adaptive management, and applicable law and policy; however, we are concerned with the following:

- Financing mechanisms,
- Determining consistency with the Delta Plan regarding covered actions,
- Establishing useful performance measures,
- Using best available science, and
- Missing policies.

Council members have repeatedly asked for specific language changes and we responded in the attachment to our April 8, 2011 comment letter, which provided detailed specific comments and language changes on the Second Draft Delta Plan. Suggested language changes that were not made in the Third Draft still apply, especially the language changes regarding Chapter 9, Finance Plan Framework to Support Coequal Goals.

Financing Mechanisms

The Finance Plan recommends potential fees to be placed on upstream diverters or dischargers, unrelated to any specific impacts demonstrated by sound science related to an individual diversion or discharge. The Finance Plan chapter should clearly identify all sources of funding that will be used to finance programs and projects in the Delta, not suggest new fees to support the Council's actions. The way this chapter is written regarding other stressor fees is simplistic, arbitrary, and does not fairly evaluate all potential other stressor fees.

SRCSD takes great exception to the Third Draft's discussion of potential funding sources, and particularly "stressor fees" as related to National Pollution Discharge Elimination System (NPDES) discharges. Advocating a water quality loading charge based on the logic that a loading fee would be simple is not a reasonable justification for imposing a fee. This logic appears punitive and is inappropriate. Please specify a reason that compliance with NPDES permit limitations and/or adopted water quality standards is insufficient and requires further costs to ratepayers absent an identifiable impact to beneficial uses.

The concept fails to recognize that NPDES dischargers *already* pay vast sums to reduce loadings and comply with water quality standards. Municipalities, whatever level of treatment they employ, have committed, and commit on an ongoing basis, vast sums for the purpose of preventing stresses to the ecosystem. The Regional Water Board is required to develop permit effluent limitations to ensure that NPDES discharges do not cause or contribute to violations of adopted water quality standards. Compliance with such limitations requires billions of dollars of capital costs and very significant annual operation and maintenance costs. Municipalities also implement source control and other programs, all at a cost to the ratepayers. Additionally we already pay permit fees to the State Water Board that includes additional fees for monitoring programs. There is simply no justification or logic to require additional fees. NPDES dischargers are required to meet adopted numeric and narrative water quality standards that are protective of human health and the environment. SRCSD's discharge is in compliance with our permit under the Clean Water Act and Porter Cologne, is protective of beneficial uses, and therefore does not fit into a category for an "other stressor" fee.

Covered Actions

The Delta Plan, as currently drafted, still is unclear in its scope. Clearly identifying what is a covered action is important to the Council and to proponents of projects in and around the Delta. However, it must also align with the statutory authority. An initial step to clarify what is or is not a covered action would be to state the statutory exemptions. In keeping with the theme of stating statutory requirements in boxes on opposing pages, a box with the statutory exemptions to covered actions would be helpful. Adding examples of exemptions would also be extremely helpful. We recommend adding the issuance of a NPDES permit as another example of an exemption, and any related activities required as part of that State/Federal permit, as well as the California Endangered Species Act permit example.

The Third Draft indicates that when a covered action "has a connection to an out-of-Delta action(s)", proponents must evaluate whether the out-of-Delta action significantly contributes to the need for the covered action. Even though the definition of significant is attempted in the Third Draft, it is still vague and is overly broad and encompassing, subjecting non-Delta actions to the Delta Plan's regulatory requirements. The authority to extend beyond the Delta is a project specific authorization, not a global authorization resulting in a significant portion of the State being included within the Delta Plan.

Objectives and Performance Measures
Meaningful performance measures can help measure the effectiveness of an action(s) in relationship to the environment. Performance measures created through an adaptive management processes tend to provide a better basis to judge whether actions taken to restore the Delta are actually working.

In the water quality chapter, the performance measures should relate back to aquatic species, and none include environmental relevance. Most importantly **ambient** water quality concentrations and trends should be included because those water quality concentrations can be compared to standards, and related to the environmental relevance of a particular constituent in terms of beneficial use impacts. A suggested target would be to not exceed established water quality standards, with adaptive management triggers and responses taken when the established water quality standards is exceeded in the receiving water. It is important to include narrative performance measures so progress can be evaluated and strategies modified, as necessary. The Delta Plan should focus on outcomes with a narrative objective for the performance measure, not just measuring what can be measured without relating it back to aquatic species or human health concerns.

Best Available Science
An April 27, 2011 pre-print publication from the Limnology and Oceanography Journal titled "Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006, Glibert 2010)" by, James E. Cloern, et al (Attachment One) succinctly and strongly states that the conclusion in Glibert 2010 linking the SRCSD treatment plant discharge to the Pelagic Organism Decline (POD) was based on a flawed statistical approach. Also the conclusions drawn from Glibert's use of CUSUM correlation analysis conflict with overwhelming evidence that the POD is due to habitat alterations, water diversions, etc.

The short paper is a statistics critique, however, all of Glibert's conclusions flowed from her limited statistical review (i.e. no other kind of evidence from the Delta to support the statistics-based conclusions about the food web was reviewed). We request you include this review by prominent Delta scientists as part of the narrative on environmental water quality, and reword the environmental water quality problem statement accordingly

Missing Policy
The current draft uses this language in places where Policies have not been articulated:

"At this time, there are no policies with regulatory effect included in this section."

This language implies that policies will be forthcoming in the fourth draft of the Delta Plan where they are not currently articulated. Because the policies, rather than the recommendations, are described as the enforceable elements of the Plan, stakeholders concerned about the Delta Plan's role in these areas will apparently be limited to a few days or weeks to comment on these important elements of the Delta Plan after they are publicly released for the first time in the fourth draft of the Delta Plan in May.

This is a concern because we can provide the Council better input when a reasonable amount of time is given for consideration of regulations that are being proposed prior to commenting. We are providing specific comments in attachment two that we would like the Council and their staff to consider and incorporate, where appropriate, into the Fourth Draft of the Delta Plan.

Should the Council or staff have any questions about these comments, please contact me at 916-876-6030, dornl@sacsewer.com.

Sincerely,

Linda Dorn
Environmental Program Manager

Attachment 1: April 27, 2011 Pre-Print Publication "Perils of correlating CUSUM-transformed variables to infer ecologicalrelationships (Breton et al. 2006, Glibert 2010)" Limnology and Oceanography, James E. Cloern,a,* Alan D. Jassby,b Jacob Carstensen,c William A. Bennett,d Wim Kimmerer,e Ralph Mac Nally,f David H. Schoellhamer,g Monika Winder.

Attachment 2: Specific SRCSD Comments on the Third Draft of the Delta Plan by Chapter, Page and Line Number

Cc: Cliff Dahm, Delta Science Program
Richard Norgard, Chair Independent Science Board
Mike Healy, Co-Chair Independent Science Board
Stan Dean, District Engineer
Terrie Mitchell, Manager Legislative and Regulatory Affairs
Prabhakar Somavarapu, Director Policy and Planning

Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006, Glibert 2010)

James E. Cloern,[a,*] Alan D. Jassby,[b] Jacob Carstensen,[c] William A. Bennett,[d] Wim Kimmerer,[e] Ralph Mac Nally,[f] David H. Schoellhamer,[g] Monika Winder,[h,i]

Suggested citation:
Cloern, J.E., A.D. Jassby, J. Carstensen, W.A. Bennett, W. Kimmerer, R. Mac Nally, D.H. Schoellhamer and M. Winder. 2011. Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006, Glibert 2010). Limnology and Oceanography, in press.

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We comment on a nonstandard statistical treatment of time-series data first published by Breton et al. (2006) in Limnology and Oceanography and, more recently, used by Glibert (2010) in Reviews in Fisheries Science. In both papers, the authors make strong inferences about the underlying causes of population variability based on correlations between cumulative sum (CUSUM) transformations of organism abundances and environmental variables. Breton et al. (2006) reported correlations between CUSUM-transformed values of diatom biomass in Belgian coastal waters and the North Atlantic Oscillation, and between meteorological and hydrological variables. Each correlation of CUSUM-transformed variables was judged to be statistically significant. On the basis of these correlations, Breton et al. (2006) developed "the first evidence of synergy between climate and human-induced river-based nitrate inputs with respect to their effects on the magnitude of spring *Phaeocystis* colony blooms and their dominance over diatoms."

Using the same approach, Glibert (2010) reported correlations between CUSUM-transformed abundances of organisms occupying many trophic levels and a range of environmental variables in the San Francisco Estuary, California. These correlations were reported to be statistically significant, and on this basis Glibert (2010) concluded that recent large population declines of diatoms, copepods and several species of fish were responses to a single factor – increased ammonium inputs from a municipal wastewater treatment plant. The study by Breton et al. (2006) is consistent with a large body of research demonstrating the importance of climate and human activity on phytoplankton communities in Belgian coastal waters (Lancelot 2007). However, Glibert's (2010) study piqued our curiosity about correlations between CUSUM-transformed variables because it contradicts the overwhelming weight of

evidence that population collapses of native fish (Sommer et al. 2007) and their supporting food webs in the San Francisco Estuary are responses to multiple stressors including landscape change, water diversions, introductions of exotic species, and changing turbidity (Bennett and Moyle 1996; Kimmerer et al. 2005; Cloern 2007; Jassby 2008; Mac Nally et al. 2010; Thomson et al. 2010). We ask here how CUSUM transformation leads to inferences about such cause-effect relationships when visual inspection of the data series (e.g., Fig. 1) shows no association between wastewater ammonium and fish abundance.

We emphasize an important distinction between the CUSUM chart and CUSUM transformation. The CUSUM chart is a well-established technique of quality assurance for industrial processes (Page 1954). The method involves keeping a running summation of the deviations of the quality of the quantity of interest (e.g., concentration of an industrial chemical) based on a sample of size n. If the quantity suddenly jumps, or gradually drifts from the specified tolerance, then a warning is raised and the process is stopped. The CUSUM chart has been used as a valuable off-line method in aquatic sciences to detect and resolve climatic (Breaker 2007) and ecological (Briceño and Boyer 2010) regime shifts, as well as departures of water-quality indicators from compliance conditions (Mac Nally and Hart 1997). In contrast, there appears to be no history for regression (or correlation) analyses on CUSUM-transformed variables prior to its use by Breton et al. (2006), and we have found no theoretical development or justification for the approach. We prove here that the CUSUM transformation, as used by Breton et al. (2006) and Glibert (2010), violates the assumptions underlying regression techniques. As a result, high correlations may appear where none are present in the untransformed data (e.g., Fig. 1). Regression analysis on CUSUM-transformed variables is, therefore, not a sound basis for making inferences about the drivers of ecological variability measured in monitoring programs.

This issue is sufficiently important to warrant exploration of the approach, which we present here.

The CUSUM function

The CUSUM function is a mathematical discrete operator that transforms an input time series (x_t) to an output time series (y_t) representing the running total of the input.

$$y_t = \sum_{i=1}^{t} x_i \tag{1}$$

The CUSUM function often is applied to time series of standardized residuals to detect changes in the mean of the time series (Zeileis et al. 2003; Breaker 2007). The CUSUM function changes the statistical properties of the input time series. If the standardized input time series consists of independent observations with zero mean ($E[x_t]=0$) and variance σ^2 ($V[x_t]=\sigma^2$) then

$$E[y_t]=\sum_{i=1}^{t} E[x_t]=0 \tag{2}$$

$$V[y_t]=\sum_{i=1}^{t} V[x_i]=t\cdot\sigma^2 \tag{3}$$

$$Cov[y_t, y_{t-1}]=Cov\left[\sum_{i=1}^{t} x_i, \sum_{i=1}^{t-1} x_i\right]=(t-1)\cdot\sigma^2 \tag{4}$$

$$Corr[y_t, y_{t-1}]=\frac{Cov[y_t, y_{t-1}]}{\sqrt{V[y_t]\cdot V[y_{t-1}]}}=\frac{(t-1)\cdot\sigma^2}{\sqrt{t\cdot\sigma^2\cdot(t-1)\cdot\sigma^2}}=\frac{t-1}{\sqrt{t\cdot(t-1)}} \tag{5}$$

This means that the variance of the CUSUM-transformed variables and the autocovariance between two consecutive observations of the CUSUM-transformed variables both grow linearly with time and, consequently, the autocorrelation of the CUSUM-transformed variables quickly approaches 1.

Two key assumptions behind tests derived from standard regression analyses are that the observations comprising the sample are independently and identically distributed (IID). As shown above, both assumptions are violated when a random input variable is CUSUM-transformed because: the variance is not constant, so the transformed observations are not identically distributed; and the transformed observations are autocorrelated and therefore not independent of one another. Thus, applying statistical regression techniques to CUSUM-transformed time series violates the two most crucial assumptions for these tests.

CUSUM transformation inflates correlation

The CUSUM of a purely random process is a pure random walk, an example of a difference-stationary variable (because its first difference is stationary). Pfaff (2006) described the difficulty of using difference-stationary variables in regression and correlation: "In this case, the error term is often highly correlated and the t and F statistics are distorted such that the null hypothesis is rejected too often for a given critical value; hence the risk of a 'spurious regression' or 'nonsense regression' exists. Furthermore, such regressions are characterized by a high R^2." Regressions involving cumulative variables such as those produced by CUSUM transformation are classic examples of spurious regression and a well-known problem in econometrics (Hendry 1980).

To illustrate the problem more concretely, we conducted the following Monte Carlo experiment. We first generated two independent, standardized (mean 0, standard deviation 1), normal random processes of length 30, about the length of many annualized time series available from monitoring data (e.g., those analyzed by Glibert 2010). We then calculated the Pearson correlation between these two series and also between their CUSUM-transformed values. We

repeated the process 100,000 times, yielding two distributions of correlation coefficients from which we generated 95% confidence intervals (CI). The distribution of CUSUM correlations is very different from the distribution of correlations of the untransformed variables (Fig. 2). The 95% CI is (-0.36, 0.36) for the original variables (Fig. 2A), but (-0.71, 0.71) for the CUSUM-transformed variables (Fig. 2B). Thus, correlations must exceed 0.71 (instead of 0.36) for CUSUM-transformed variables to be considered significant at the $p < 0.05$ levels. This implies that the CUSUM transformation increases the probability of making a Type I error (incorrectly rejecting a null hypothesis of no correlation) from 5% to 42% when Pearson's statistics are applied. Therefore, on this basis alone, the p-values for correlations of CUSUM-transformed variables reported by Breton et al. (2006) and Glibert (2010) are incorrect.

The above experiment was based on independent random processes. Water resources data, however, commonly exhibit serial correlation (Helsel and Hirsch 2002). The introduction of serial correlation accentuates the problem by broadening the distribution of correlation coefficients even further than in the example above. To measure this effect, we repeated the simulations after introducing varying amounts of first-order serial correlation (r_1, r_2) into the paired series that otherwise represented random normal processes (using the *arima.sim* function of R; R Development Core Team 2010). This second experiment shows how the 95% CIs for the correlations broaden in proportion to the strength of serial correlation (Table 1, Fig. 2C). The presence of serial correlation thus increases the probability of making a Type I error further (53% when $r_1 = r_2 = 0.5$), making any conclusions from such correlations correspondingly less reliable. Even if a significance level of $p < 0.0001$ were used, the probability of making a Type I error (19% when $r_1 = r_2 = 0.5$) would still be much greater than 5%.

We showed that two CUSUM-transformed variables often have an apparent statistically significant correlation even if none exists between the original untransformed series. Moreover, even if a statistically significant relationship could be established between CUSUM-transformed variables, there is no proven basis for inferring relationships between the original variables. Given these difficulties, we wonder what purpose is served by CUSUM transformation for exploring relationships between two variables. As a real example, Glibert (2010) inferred a strong negative association between delta smelt abundance and wastewater ammonium from regression of CUSUM-transformed time series. However, the Pearson correlation (r = -0.096) between the time series (Fig. 1) is not significant, even under the naive IID assumptions (p = 0.68). In short, correlations between CUSUM-transformed variables should not be used as a substitute for analysis of the original untransformed variables.

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Table 1. Upper limits of the 95% CIs for correlation between two untransformed and CUSUM-transformed random variables with different combinations of serial correlation coefficients, r_1 and r_2.

r_1	r_2	Untransformed	CUSUM-transformed
0.0	0.0	0.36	0.71
0.1	0.1	0.36	0.73
0.1	0.5	0.38	0.77
0.1	0.9	0.39	0.82
0.5	0.5	0.44	0.81
0.5	0.9	0.51	0.86
0.9	0.9	0.71	0.92

Figure Legends

Figure 1. Annual (A) abundance index of delta smelt (*Hypomesus transpacificus*) in the San Francisco Estuary and (B) wastewater loadings of ammonium to the Sacramento River, 1985-2005. Treatment plant data were obtained from the Sacramento Regional County Sanitation District (S. Nebozuk pers. comm., 28 July 2006). Monthly loading was calculated from discharge-weighted ammonium concentrations using the methods described by Jassby and Van Nieuwenhuyse (2005). Delta-smelt abundance data were obtained from the California Department of Fish and Game (http://www.dfg.ca.gov/delta/data/townet/indices.asp?species=3).

Figure 2. (A) Frequency distribution of correlation coefficients for two independent random normal series of length 30 (n = 100,000). (B) Same as A after the samples are CUSUM-transformed. (C) Same as B, but with first-order serial correlation of 0.5 introduced into the otherwise random normal processes. Vertical dashed lines, 95% CI.

Fig 1

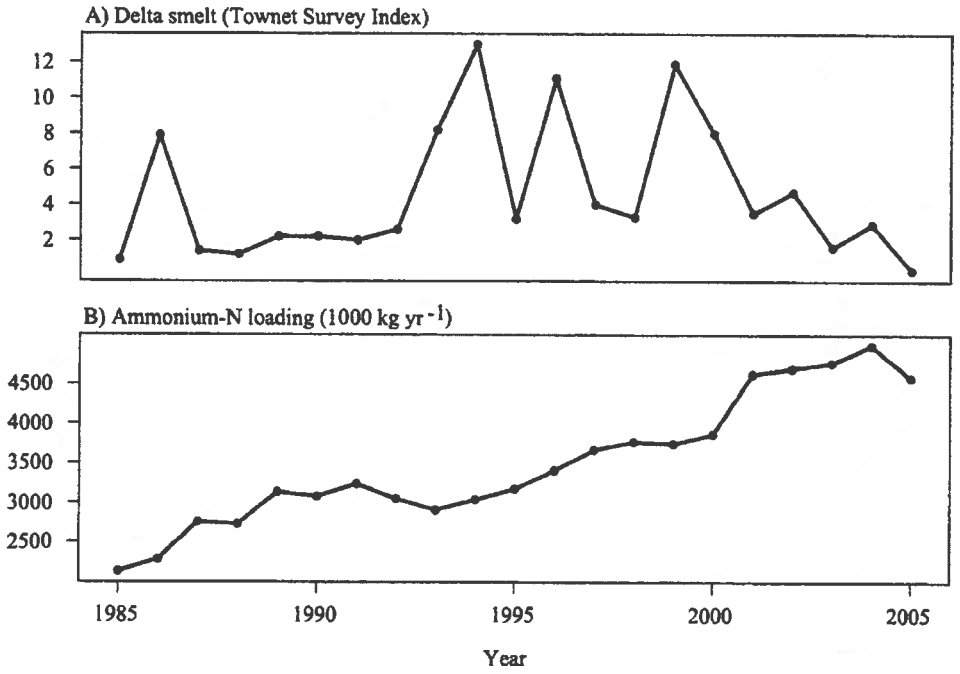
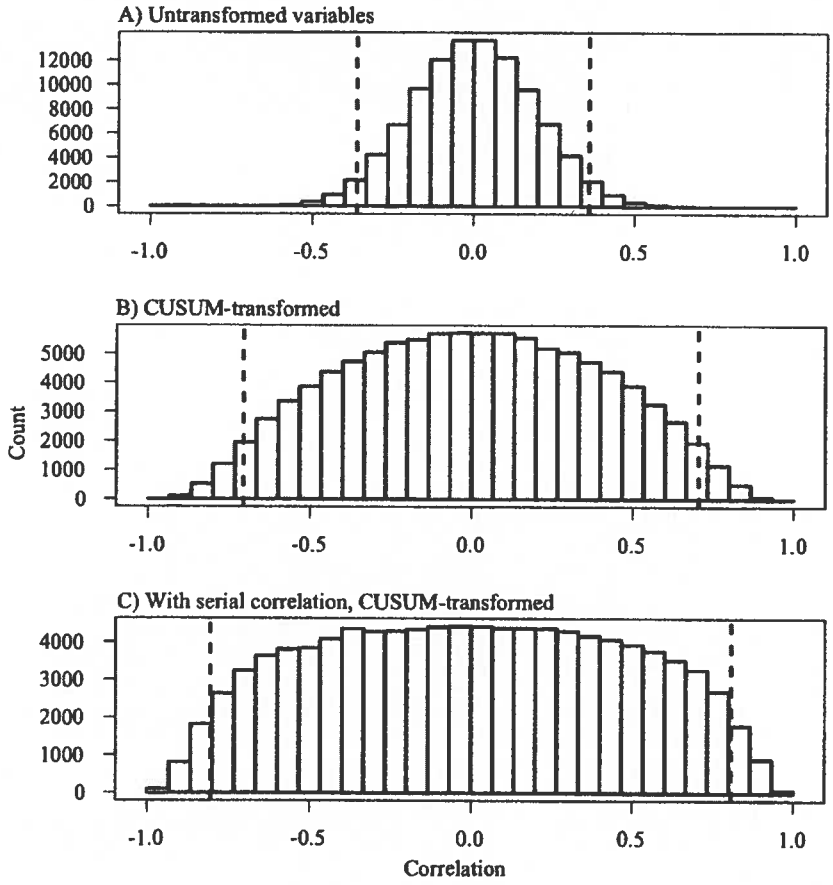

A) Delta smelt (Townet Survey Index)
12
10
8
6
4
2
B) Ammonium-N loading (1000 kg yr -1)
4500
4000
3500
3000
2500
1985
1990
1995
2000
2005
Year

Fig 2


A) Untransformed variables
12000
10000
8000
6000
4000
2000
0
-1.0
-0.5
0.0
0.5
1.0
B) CUSUM-transformed
Count
5000
4000
3000
2000
1000
0
-1.0
-0.5
0.0
0.5
1.0
C) With serial correlation, CUSUM-transformed
4000
3000
2000
1000
0
-1.0
-0.5
0.0
0.5
1.0
Correlation

Attachment Two: Specific SRCSD Comments on the Third Draft of the Delta Plan by Chapter, Page and Line Number

All suggested language changes will use strikeout for deletions and bold for additions. Thank you for providing the Word version to make this task less time consuming. We are not including suggested language changes from our April 8 comment letter on the Second Draft. Any language changes that were not made to the Third Draft, as recommended in our Second Draft comment letter still apply.

Chapter 2 Science and Adaptive Management for a Changing Delta

As a general comment on this chapter, the Delta Plan should contain language that specifically addresses situations where the model linkages may not indicate clear evidence between actions and results, cases where "no action" or natural attenuation may be the most appropriate action rather than expensive controls or studies. This may be the case for many of the legacy or historically discharged contaminants that are bound to the sediment but are not currently discharged in significant quantities to the Delta or its upstream rivers or tributaries. While this is a requirement of the EIR for the Delta Plan, the Delta Plan should specifically address this type of situation that may result in expensive projects without clear or measurable environmental benefit.

Page 25, Lines 1-27-The Delta Plan should contain some clear guidelines for measuring achievements including setting and evaluating targets that impact our regional and state economy. An initial cost/benefit analysis or a cost per unit improvement done at the planning phase of a project should be re-checked at implementation to ensure that the costs and benefits are being adequately projected, monitored and evaluated. The projects selected should be those that are both effective and efficient projects, particularly in this economic climate.

Page 27, Lines 28-31-Consistency with the scientific process should include the following elements: well-stated objectives; a clear conceptual model; a good experimental design that can reasonably be shown to result in making measurable progress toward meeting the stated objectives with standardized methods for data collection; statistical rigor and sound logic for analysis and interpretation; and clear documentation of methods, results, and conclusions. The best science is transparent; it clearly outlines assumptions and limitations, including our ability to control the natural system and our ability to measure and monitor changes resulting from a designed project or control and to reasonably evaluate and interpret those changes.

Page 27, Lines 43-44- Should this say "These limitations shall be clearly documented when used to influence decisions."? or "when used as the basis for decisions."?

Page 31, Lines 1-9- Effective governance should include an evaluation of the best expenditure of public funds and the social and economic impacts of utilizing those funds, across all impacted social classes. Actions should be taken to minimize those impacts, including an evaluation of previous plans, policies, and regulatory mandates that are no longer beneficial or necessary, but are still required.

Governance should not only be effective but also efficient. Studies and regulations should occur within the budgetary limitations of the state, the agencies, the utilities, and the businesses and citizens that will be required to pay for this plan and other simultaneous environmentally-related plans, policies and regulatory mandates. Only those actions that are effective, efficient, measurable, beneficial and necessary should be mandated.

Chapter 3 Governance: Implementation of the Delta Plan

Page 35, Lines 24-25- States "This Delta Plan incorporates and builds upon existing state policies where possible, with the intention of meeting the Act's requirements without establishing an entirely new set of policies." It would be helpful to list the existing state policies that are referenced here for clarity.

Page 37, Line 12-States the Council is determining significant impacts. Would the entity performing the covered action determine if there are significant impacts? The definition of what is a significant impact is still unclear.

Chapter 4 A More Reliable Water Supply for California

Page 54, Line 37-The Council members should keep in mind that the cost of all utilities are impacting California's residents and businesses and affect the State's ability to recover economically. While the Sacramento San Joaquin Delta is an important asset to the state, there are many other competing interests that place demands on our personal, local and state budgets. The costs of utilities, including water, sewer, energy, and the costs of increasing related regulation in our state place a tremendous burden on our communities. The Delta Plan should consider not only the retail water rate structures that promote water conservation, but also examine any additional fees or rate tiers added by this plan to ensure that the entire water rate structure for normal, required household, business and industry water usage does not place a significant burden on our citizens and our economy.

Chapter 5 Ecosystem Restoration

A general comment on the subsection "Reducing Threats and Stresses" is that some of the stresses to the ecosystem are the result of historical choices made related to infrastructure construction, and public safety. The Delta plan should allow adequate time to correct these types of issues so as to avoid placing an undue and unrealistic economic burden on the local economies. The Plan should properly prioritize changes to infrastructure and public works or publically funded capital improvement projects or other projects that place a significant financial burden on California residents and businesses by allowing appropriate phasing, timing, and providing funding assistance as required. All required projects or activities should be evaluated to determine whether reasonable proof exists that the project will result in a measurable and significant benefit or improvement to the Delta ecosystem. The plan should not impose artificial deadlines on projects but rather should consider that improvements to the Delta ecosystem will take many years.

Page 69, Lines 9-13-ER R4- Authority to regulate stressors resides with the State and Regional Water Boards, therefore they should be involved with any workshops that are developed to provide recommendations to minimize their impact. Additionally other stakeholders should be included in these workshops as they can bring their expertise, adding value to any recommendations that would be developed. Prioritizing the measures to minimize stressor impacts should be decided upon collectively, so that any one interest does not dominate the prioritization decisions . A good

example of how these workshops could be conducted is the Ammonia Workshop from March 2009, where CalFED, the Water Boards, DFG, State Water Contractors (or their representatives), and SRCSD collaboratively planned the workshops that included participation by well respected members of the scientific community. We recommend the following language changes.

> By January 1, 2013 the Delta Science Program, in conjunction with the Department of Fish and Game, the Department of Water Resources, **State and Regional Water Boards, and other** ~~relevant agencies~~ **interested stakeholders** should conduct workshops with the objective of providing specific recommendations to the Council for measures to minimize stressor impacts on the Delta ecosystem and on the prioritization of such measures.

Page 71, Lines15-16-We recommend the following language change regarding performance measures for threats and stressors.

> **Progress toward understanding** ~~Reducedconcentrations~~ **the role** of nutrients (nitrogen and phosphorus compounds) **in** ~~that support~~the growth of undesirable algae or excessive growth of nuisance aquatic plants **in the Delta**.

This language would be consistent with the performance measures for the rest of the threats and stressors listed, and the change identifies an outcome as opposed to measuring things simply because they can be measured.

Chapter 6 Improve Water Quality to Protect Human Health and the Environment
Page 77, Lines 17-26- As stated in our March 28, 2011 comment letter on the Draft Water Quality Findings, 303(d) listings of impaired waters under the Clean Water Act are water body specific. Impairment listings for San Francisco Bay are not appropriately combined with the listings for the Delta. Each water body has its own water quality issues. The water quality issues in San Francisco Bay are in many cases distinct from Delta issues and do not imply impairment in the Delta. The Delta Plan should focus primarily on contaminants of concern in the Delta based on the 303(d) listings for the Delta. The Delta Plan should also distinguish between water quality issues in the Stockton Ship Channel as opposed to the remainder of the Delta. In particular, the listings for dissolved oxygen, pathogens and dioxins/furans are specific only to the

Ship Channel. When consulting USEPA's 2009 approved 303(d) listing of impaired water bodies for the Delta, **none** are listed as impaired due to nutrients or pyrethroids, for any beneficial use.

Attachment Two: Specific SRCSD Comments on the Third Draft of the Delta Plan by Chapter, Page and Line Number

We are providing the following specific language to identify which water bodies in the Estuary are impaired.

~~Contaminants of concern include organophosphate, pesticides (diazinon and chlorpyrifos), pyrethroid insecticides, carbamate pesticides (carbaryl and carbofuran), herbicides (propanil, diuron, and others), fungicides, elemental and methyl mercury, selenium, copper, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, flame retardants, pharmaceuticals and personal care products, nutrients, and others. Additional water quality issues within the Delta include salinity, bromide, dissolved organic carbon compounds, dissolved oxygen, pathogens, turbidity, temperature, toxic algal blooms, and invasive species. Exceedances in these constituents impair the ability of these waters to support beneficial uses, such as municipal water supply, recreational use, agricultural water supply, and aquatic life and wildlife beneficial uses. Sources of impairment include agriculture, urban runoff, resource extraction and abandoned mines, and ballast water (invasive species).~~

The following water bodies of the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary are impaired based on violations of water quality standards for the parameters listed under that water body. Note that not all parameters are listed in all segments of the water body.

<u>Delta waters – 303(d) listed parameters</u>
Diazinon
Chlorpyrifos
DDT
Electrical Conductivity (EC)
Mercury
Invasive species
Unknown toxicity
Group A pesticides
PCBs
Chlordane
Dieldrin

<u>Stockton Ship Channel</u>
Diazinon
Chlorpyrifos
DDT
Electrical Conductivity (EC)
Mercury
Invasive species
Unknown toxicity
Group A pesticides
PCBs
Chlordane
Dieldrin
Dioxins and Furans
Dissolved oxygen (DO)
Pathogens

San Francisco Bay – 303(d) listed parameters
Chlordane
DDT
Dieldrin
Dioxins, Furans
Invasive Species
Mercury
PCBs
Selenium
Polycyclic Aromatic Hydrocarbons
Trash

The laundry list of contaminants of concern in the Third Draft is not productive without an explanation of the documented issue. Information is needed to explain the nature of the "issues" and where they exist. Lines 23 -25 are inaccurate, in that many of the listed constituents do not even have standards established against which an exceedance could be measured.

We recommend the following language change:

~~Exceedences in these constituents impair the ability of these waters to support beneficial uses, such as municipal water supply, recreational use, agricultural water supply, and aquatic life and wildlife beneficial uses.~~

Page 78, Line 12-We recommend the following language change to accurately reflect entities that can be issued NPDES permits:

The State Water Resources Control Board and Regional Water Quality Control Boards issue National Pollutant Discharge Elimination System permits for municipalities and industries; permits include both General Permits and individual permits (e.g., the General Permits covering stormwater discharges from industrial and construction activities; individual National Pollutant Discharge Elimination System permits for **municipal and industrial** wastewater treatment facilities, **and municipal stormwater discharges**).

Page 78, Line 35-36-SRCSD believes the addition of a map showing TMDLs under development is an excellent idea, but you should also identify where TMDLs have been completed to better represent the accomplishments of the Water Boards.

Page 79, Lines 14-18- We recommend the following language change to better understand the authority of the State Water Resources Control Board.

The Council recognizes the State Water Resources Control Board's role and authority in regulating water quality **and permitting water rights**, and supports and encourages the timely development and enforcement of programs (e.g., **water rights**, water quality standards, TMDLs, Waste Discharge Requirements, and NPDES) to ~~**reduce pollutant loads**~~ **protect beneficial uses** and progress toward compliance with pollutants that are causing water quality impairments in the Delta.

Attachment Two: Specific SRCSD Comments on the Third Draft of the Delta Plan by Chapter, Page and Line Number

Page 80, Lines 1-6-We recommend the following language changes to reflect the salinity contribution to the San Joaquin portion of the Central Valley, and hence the Delta from the San Joaquin River, from the Central Valley Project and State Water Project contributions that are greater in salinity than the east side tributaries.

> The salinity regime in the Delta is driven both by natural flows and water management. Achievement of the coequal goals will require comprehensive flow standards that balance ecosystem and water supply needs. Salinity also is a contaminant discharged to **the** Delta and Delta water~~ways~~**shed** resulting from human activities (such as agriculture, **stormwater, water exports**, and wastewater treatment). ~~Salinity in this context is addressed under Drinking Water Quality below.~~

Page 80, Line 17 – We recommend the following edit to this sentence.

> Furthermore, exceedances of **standards for** pathogens and pathogen indicators …

Page 80, Lines 26-28- We recommend the following language change to accurately reflect the sources of pollutants, as confirmed by recent technical reports for the Central Valley Drinking Water Policy Workgroup. Available data do not indicate that concentrations of constituents of concern to drinking water agencies are increasing over time. Additionally there has been no evidence that the recreational beneficial use of the Delta has been impaired outside the Stockton Ship Channel.

> Pollutants contained in municipal, industrial, ~~and~~ agricultural discharges, **and from natural and uncontrolled legacy sources flowing into** ~~to~~ the Delta and its tributary waterways **have affected the quality of water used** ~~contribute to the degradation of Delta water supplies~~ for drinking water**.** ~~and body-contact recreation where water may be ingested.~~

Page 81, Lines 1-3, WQ R4-We are requesting that you include both water supply and water dischargers participation in CV-SALTS. The current wording of the recommendation implies that only dischargers should be required to participate in CV-SALTS and the success of that initiative depends upon all who use Delta waters and their respective watersheds, not just one segment.

> The State Water Resources Control Board and Central Valley Regional Water Quality Control Board should require participation by all water users that ~~directly and indirectly discharge flows~~ **are supplied water from the Delta and the Delta Watersheds or discharge flows to the Delta and the Delta Watersheds** in the Central Valley Salinity Alternatives for Long-Term Sustainability Program.

Page 81, Lines 5-10- The text states as fact that nutrients are negatively affecting phytoplankton productivity and composition in the Delta when in reality the effect of nutrients on the Delta is a matter of ongoing research and debate amongst scientists. The statement should be modified to reflect this uncertainty with respect to nutrients and food web impacts. SRCSD will provide specific language changes to the fourth draft of the Delta Plan regarding environmental water quality, as it may be changed considerably based on pre-print publication of Cloern, et al, discussed below. Also the Council's staff should review the State Water Quality Control Board *Numeric Nutrient Endpoint Development for San Francisco Bay Estuary: Literature Review and Data Gaps*

Analysis in developing the narrative in the fourth draft regarding environmental water quality. (http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/amendments/estuarynne.shtml#public)

An independent review by some of the Delta's top scientists (Attachment One) disputes Glibert's use of statistical correlation analysis to conclude that ammonia from SRCSD is linked to the POD. This independent review found the conclusions of Glibert were based on flawed statistics and conflict with overwhelming evidence that the POD has occurred due to numerous factors, including habitat alterations, water diversions, etc. SRCSD respectfully requests that Glibert's conclusions and work be removed from scientific references regarding the effect that ammonia, nitrate, or the ratio of nitrogen or phosphorous may have on productivity or species composition of phytoplankton in the Delta. If the Council chooses to continue to cite Glibert's work they should also include the fact that other prominent scientists working in the Delta do not agree with the conclusions generated from the CUSUM correlation analysis that forms the primary basis for Glibert's conclusions.

Page 81, Lines 35-37 WQ R5-As discussed above there is not agreement among scientists regarding nutrients role in the Delta, and even the Delta Science Program has recognized this by funding multiple studies regarding the role of nutrients in the Delta. The results from these studies will not be available for several years, and therefore SRCSD cautions against a hard due date for developing numeric nutrient criteria which pre-supposes the outcome of this ongoing research. We recommend the following language changes.

- The State Water Resources Control Board and the San Francisco Bay and Central Valley Regional Water Quality Control Boards should develop and adopt ~~numeric~~ **nutrient** objectives, **either narrative or numeric, where appropriate**, ~~for nutrients~~ in the Delta and Delta watershed ~~by January 1, 2014~~ **within two years of completing Delta Science Program studies regarding nutrients in the Delta.**

SRCSD has a number of observations and concerns regarding the development of numeric nutrient criteria as discussed in the paragraphs below.

Significant and well-documented issues exist regarding the establishment of water column objectives for nutrients. In many cases, when numeric criteria/standards for Nitrogen (N) or Phosphorous (P) have been recommended for flowing streams and estuaries (e.g., USEPA Ecoregion recommendations) or proposed as enforceable limits (e.g., recently promulgated USEPA nutrient standards for Florida streams) mechanistic linkages between particular N or P concentrations and bona fide indicators of impairment (such as low dissolved oxygen concentrations) have not been proven. Instead, selection of nutrient limits has relied on poorly tested, or completely untested, assumptions that nutrient concentrations directly and predictably cause certain biological outcomes. Two common approaches for proposing numeric nutrient criteria (which lack proof of stressor/response relationships) are:

(1) simple correlation analysis between N or P (as an independent variable) and a physical or biological parameter assumed to cause impairment (such as chlorophyll-a) as a dependent variable, and

(2) definition of a reference condition (or set of reference water bodies), using an indicator that may or may not be related to nutrient status of the water body, followed by arbitrary selection of nutrient limits based on a statistic (e.g., the 75th percentile) of N or P concentrations reported for the reference water bodies.

Both approaches suffer from the absence of demonstrated cause-and-effect between nutrient concentration and biological impairment, which is especially important because multiple non-nutrient-dependent factors (light, flows, grazing, temperature, stratification, etc.) are co-determinants of primary productivity and community composition at the bottom of the food web in all types of water bodies.

As an example, the USEPA recommends using the following concentrations as water-column criteria for stream and rivers in Ecoregion I, Subregion 7 (which includes the Central Valley and the Delta)

Total N: 0.300 mg/L
Total P: 0.042 mg/L
Phytoplankton Chlorophyll-a: 8 µg/L

These thresholds are based on the assumption that chlorophyll-a levels above 8 µg/L represent an impairment in this ecoregion. However, the chlorophyll-a threshold for nutritional adequacy for Delta zooplankton cited in Interagency Ecological Program- and other Delta literature is 10 µg chl-a/L, and the historic springtime phytoplankton blooms that Delta managers presumably aim to restore in the estuary produced chlorophyll-a concentrations in the range 20-30 µg/L. USEPA nutrient criteria recommended for the freshwater Delta are therefore designed to maintain what would be considered by many Delta scientists to be starvation levels for Delta zooplankton.

The approach used by USEPA in Florida is an example in which nutrient limits were selected without defensible evidence of cause and effect between nutrient concentrations and biological indicators of impairment. In Florida, reference water bodies were selected based on benthic invertebrate composition. Then – without any data to suggest that nutrient concentrations directly or indirectly affect benthic invertebrate composition – the 75th percentile concentration of N or P for the reference streams was arbitrarily selected as a nutrient standard. The arbitrary nature of this procedure is well illustrated by the graph published in the Chapter 2 of the *USEPA Proposed Rule for Numeric Nutrient criteria for Florida's Inland Surface Freshwaters* (see figure below) showing a lack of a relationship between total nitrogen concentrations and benthic invertebrate index scores (SCI scores) within the reference population of streams (benchmark sites).

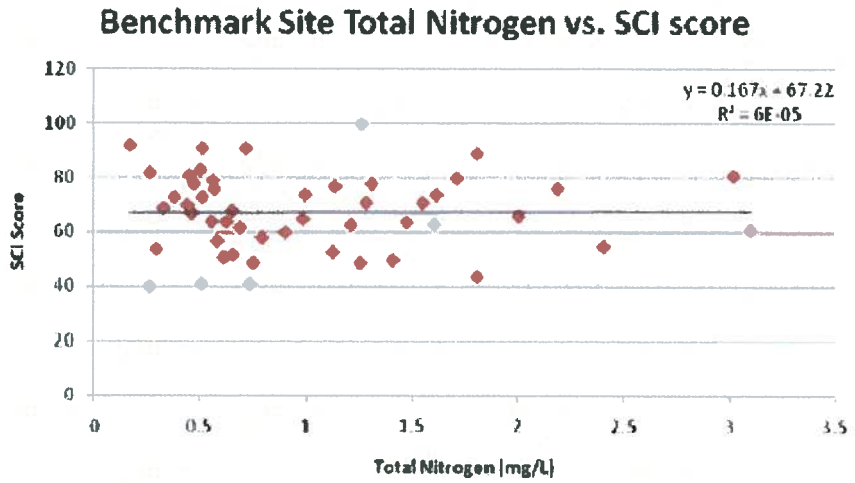


Figure 2-34. Benchmark site SCI vs. TN. Note the lack of correlation between SCI and TN throughout the range of benchmark sites. This indicates that there are no adverse effects from establishing nutrient criteria at the upper 90th percentile of the benchmark distribution. Sites scoring less than 40 on the SCI (after QA review) were excluded from the benchmark data set for calculation of the final nutrient distribution.

The difficulty of linking nutrient concentrations or loads to meaningful indicators of biological impairment is a challenge facing the Southern California Coastal Water Research Project (SCCRWP)-led Coastal Estuarine Numeric Nutrient Endpoint (NNE) process currently underway (and will be a challenge for the San Francisco Estuarine NNE group as well). The first struggle faced by the Coastal NNE technical and stakeholder groups was to achieve consensus on meaningful response variables (should they be algae, DO, algal toxins, sediment characteristics, benthic invertebrates, SAV?, etc.) - as of late 2010, this was still underway. In addition, as of late 2010, *numeric targets for response variables* were still being debated, and tools for linking nutrient loads to biological or physical indicators were not remotely available. As an added complexity, owing to the challenges of selecting targets for *response* variables , *indirect indicators* of response variables (such as selecting fish indicators for dissolved oxygen conditions) are being considered – which will be even more challenging to credibly link to nutrient loads or concentrations.

Page 81-82, Lines 42-43 and 1-2- The recommendation to develop and adopt TMDLs for pyrethroid pesticides is not yet supported by robust scientific evidence of negative impacts. Ongoing research is focusing on the most sensitive organism identified to date, *Hyallela azteca.* Environmentally relevant, i.e. ambient concentrations, of pyrethroids in the Delta have not been shown to be toxic to these most sensitive organisms; therefore a TMDL is premature based on current evidence.

Page 82, Lines 27-40, Performance Measures-It is imperative that the performance measures are designed to base decisions on improvements to water quality. Any required improvements should produce measurable, statistically significant public benefit in the most economical and most efficient manner possible. Regulation of point sources and/or non point sources to reduce minimal loads of water quality contaminants such as nitrates or mercury that result in costly public works improvements without significant measurable, or that have a questionable benefit, to water quality

should not be recommended. Higher priority should be given to projects such as water recycling projects that meet the goals of multiple plans and policies and provide many environmental benefits.

Chapter 7 Reduce Risk to People, Property, and State Interests in the Delta
Page 92, Lines 1-4, RR P5- The language below is unclear of the locations of the future setback levees, as it states that the DWR has not adopted criteria to define the locations of setback levees. SRCSD is currently planning a levee project to protect our pumping station, it is planned to be designed to DWR 200 year levee criteria, so it will meet all identified land uses according to table 7-1. We are unclear with the policy below what levees are to have setback levees. Also, identifying a timeline on when DWR should adopt this criterion would be helpful.

> Until the Department of Water Resources adopts criteria to define locations for future setback levees, any action located next to the land side of a **[which levee? A project levee? River levee?]** levee shall demonstrate adequate area is provided to accommodate setback levees, as determined by a registered civil engineer or geologist.

Chapter 9, Finance Plan Framework to Support Coequal Goals
Page 107, Line 21-Stressors should include exporters from the Delta and the associated taking of fish and other indirect effects.

Page 108, Lines 11-31-Again stressors should include exporters of Delta water. What are user fees? The crediting concept is unclear. What is a closely related activity? What rationale exists to support a finding that compliance with given water quality standards is insufficient and requires further costs to ratepayers absent an identifiable impact to beneficial uses.

Page 111, Table 9-2-Can you please explain how these dollar estimates were derived?

Page 111, Line 14-By focusing on human activities as the starting point for a financial strategy, the plan is placing the financing burden on local economies. There should be no primary and secondary financing strategy. There should be one finance strategy that is diversified, without having any one segment of our economy shouldering the economic burden. Please see our comments on Chapter 4.

Page 112 FP R7, Lines 26-37-It is not clear from this recommendation whether the fees are for Council administration or capital costs. Also, how would you calculate a fee for those who benefit from and stress the Delta, such as water exporters?

Page 114, Lines 18-26-This section seems punitive in that fines issued by the Water Boards are penalties, and multiple government entities should not be able to assess a monetary penalty for the same violation multiple times. Does this section include violations of water rights? Failure to meet salinity objectives?

Page 117, Line 23-If the revenue potential from stressor fees is not believed to be large, why put a great amount of effort into trying to establish them?